

REMARKS/ARGUMENTS

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

The applicants and the undersigned wish to thank Examiner Rojas and Examiner Donovan for the courtesies extended during the interview of February 23, 2006. The Amendment proposed during the interview has been presented above and the arguments made are repeated herein for the record.

Claims 1, 2 and 4-11 were rejected under 35 USC 103(a) as being unpatentable over Richter et al. in view of Yamamoto. Applicant respectfully traverses this rejection.

As noted by the Examiner, Richter discloses a plunger and a stator with nickel phosphide layers on respective sliding surfaces of the plunger and the accommodating portion. However, Richter does not disclose the phosphorous content of the nickel phosphide layers.

The Examiner cites Yamamoto as allegedly teaching a phosphorus content of 5-10% (actually, Yamamoto discloses adding phosphorous in the range of 8-10%). In this regard, Yamamoto intends to increase the surface hardness while achieving a desired magnetic attractive force by adding this limited amount of phosphorous. In Yamamoto, a phosphorus content beyond 10% does not apparently achieve the required magnetic attractive force between armature 4 and support 11.

The invention seeks to achieve a balance between magnetic attractive force (which decreases with increased phosphorus content) and smooth sliding movement of the plunger (which is promoted when the phosphorus content is increased). In this regard, applicant has recognized that with sliding components, such as a plunger in an accommodating portion, there are several factors that must be balanced. Increased phosphorus content increases the surface hardness which facilitates smooth sliding movement and reduces wear. However, the increased phosphorus content reduces the

magnetic attractive force. On the other hand, if the phosphorus content is reduced so that the magnetic attractive force is increased, there is increased sliding resistance due to a side attraction; a side force in the radial direction of the accommodating portion and the plunger which increases the sliding resistance. Finally, applicants have recognized that when the phosphorus content is increased, so that the side force is reduced and surface hardness is increased to facilitate sliding, a lesser magnetic force can nevertheless provide the required plunger movement (See for example pages 10 and 11 of applicant's specification). Thus, the invention achieves a balance between magnetic attractive force and smooth sliding movement of a plunger in an accommodating portion. In summary, applicants have recognized that smoother sliding movement of the plunger is promoted when the phosphorus content exceeds 10% (Figure 3) because of a reduced sliding resistance and increased surface hardness. Consequently, even though there is a reduction in the magnetic attractive force when the phosphorus content exceeds 10% (Figure 4), because sliding movement is facilitated, even with a reduced magnetic attractive force the magnetic attractive force is nevertheless sufficient to satisfactorily move the plunger. Thus, with the invention of applicant's amended claims 1 and 3, a good balance can still be achieved between the competing issues of smooth sliding movement and magnetic attraction, as long as the phosphorus content is kept equal to or less than 15%.

Yamamoto does not involve any sliding movement and there is no teaching or suggestion in Yamamoto that phosphorus in the range of greater than 10% to less than or equal to 15% would be effective. Indeed, only applicant's disclosure includes the recited phosphorus content range because the facilitated sliding movement yields satisfactory results in spite of the reduced magnetic attraction. This is not taught by Yamamoto. The remaining art of record does not teach or suggest the range claimed by applicant in the particular structure claimed, so that prior art of record does not teach or suggest the modification of Richter so as to produce the claimed invention. In

view of the foregoing, reconsideration and withdrawal of the rejection based on Richter and Yamamoto is solicited.

Claim 3 was rejected under 35 USC 103(a) as being unpatentable over Kato in view of Yamamoto. Applicant respectfully traverses this rejection.

Claim 3 is submitted to be patentable over Kato and Yamamoto for the reasons advanced above with respect to claim 1. Indeed, as noted above, Yamamoto teaches a phosphorus content limited to 8-10%. One skilled in the art would expect that a greater phosphorus content would be undesirable because of the reduced magnetic attractive force. Applicant has recognized, however, that in a structure where a plunger slides in an accommodation portion, because of the facilitated sliding realized with the increased phosphorus content, an advantageous product results in spite of the reduced magnetic attractive force. Thus, applicants have established that a satisfactory balance of surface hardness, sliding ability and magnetic attractive force can be achieved in the range of 10 to 15% phosphorus content which is not taught by nor evident from the art of record. It is therefore respectfully submitted that claim 3 is also patentable over applied art.


As agreed during the interview, limiting the phosphorus content to the range of 10 to 15% as set forth in amended claims 1 and 3 overcomes the prior art of record.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and an early Notice to that effect is earnestly solicited.

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Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 
Michelle N. Lester
Reg. No. 32,331

MNL:slj
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100